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ABSTRACT

These four units of the Learning Activity Packages (LAPs) for individualized instruction in physical science cover measuring techniques, operations of instruments, metric system heat, matter, energy, elements, atomic numbers, isotopes, molecules, mixtures, compounds, physical and chemical properties, liquids, solids, and gases. Each unit contains a rationale for the material; a list of behavioral objectives for the unit; a list of resources including texts, reading assignments, specified problems, handouts, tape recordings, lab experiments, and science activities; a problem set for student self-evaluation; suggestions for advanced study; and references. Related physical science LAPs are SE 016 423 and SE 016 424. (CC)

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U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

LEARNING
ACTIVITY
PACKAGE

INTRODUCTION
TO
PHYSICAL SCIENCE

Ninety Six High School
Ninety Six, S.C.

PHYSICAL SCIENCE

LAP NUMBER 1

WRITTEN BY G. J. Williams

REVIEWED BY J. R.

SE 016 422

RATIONALE

You are about to undertake one of the most fascinating courses of all the sciences-Physical Science.

Why study science? Through the study and discovery of scientists we increase our knowledge of the living and nonliving world. Because of scientific progress we enjoy better means of transportation and communication, live longer and healthier lives and explore other planets.

In this LAP you will learn the significance of science in our daily life. The branches of Physical Science, the basic procedure scientists use to solve scientific problems and the use of some equipment with which you will be working in the laboratory.

In your next LAP we will learn about the Metric System.

Section I

Behavioral Objectives

After using the prescribed resources listed you will on the progress and/or LAP test

___1. Define Physical Science

___2. List at least five branches of Physical Science and state what they constitute.

___3. List in order the seven basic steps involved in the scientific method for solving scientific problems.

___4. Construct a graph from given data and interpret the results of the graph.

Resources

Readings and Problems

___ The World Book Encyclopedia, Volume 17, pages 162-168

Topics:

Science

Physical Science

The Scientific Method

___ The World Book Encyclopedia, Volume 8, page 314

Topic:

The Line Graph

___ The Dictionary

___ Exploring Physical Science, pages 9-16; 466-470

___ Cambridge Work-A- Text, page 1

Physical Science

___ Handouts (1) Data to Graph

(2) Data to Interpret

(3) Data to Graph and interpret

___ Tape- Lecture-Introduction to Physical Science

___ Game- Unscrambling steps in the Scientific method

Films

Filmstrip

"The Scientific Approach"

Transparency

The Line Graph

Self-Evaluation

Objective

1 1. Define Physical Science_____

_____

_____

3 2. Arrange in order the following steps a scientist would probably use to solve a scientific problem. Drawing conclusions, stating the problem, experimenting , forming an hypothesis, interpreting the data.

1.

2.

3.

4.

5.

2 3. List at least two branches of Physical Science and tell what they constitute.

1.

2.

5 4. Construct a graph using the following data and interpret the results.

Length of pendulum	Number of swings per minute
1 foot	26
5 feet	12
½ foot	36
3 feet	16
8 feet	10

Advanced Study

___ Prepare a poster on "Applying The Scientific Method."

___Construct cut-outs of some of the tools of science (the beaker, round bottom flask etc.) using different colors of construction paper.

___ Select any one of the branches of Physical Science that interest you most and write a one page report.

___List at least 5 common superstitions and tell why scientist do not believe in superstition.

___ List at least two ways science is applied in the following categories

1.Home 3. War

2. Medicine 4. Industry

Organize a scientific approach for solving a given scientific problem.

Behavioral Objectives

After using the prescribed resources listed you will on a progress and/or LAP test:

___1. Name at least twenty-five of the thirty displayed experimental apparatus which you will use during the year.

___2. Lable on a drawing and describe the function of the following parts of a double pan platform balance: platform, slider, pointer, scale division

___3. Determine the weight of two assigned objects, with an accuracy of plus or minus two grams, using the platform balance, weights and weighing paper.

___4. Measure two assigned liquids using a graduated cylinder with an accuarcy of plus or minus two milliliters

___5. Draw a thermometer, lable the three parts, and label it with the fahrenheit and centigrade scales.

___6. Record the temperature of two liquids with an accuracy of plus or minus degrees.

___7. Convert given fahrenheit readings to contigrade reading to centigrade scales and centigrade readings to fahrenheit readings.

Section II

Resources

Readings and Problems

___1. The World Book Encyclopedia, Book T
Topics: Temperature Scales-page 195

Temperature - page 104

___2. Book of Popular Science

Topic: Thermometer- page 164-Volume 1, pages 410-411 vol3

___3. Exploring Physical Science

Topics: Fahrenheit and Celsius scales page 19

Temperature scales page 486

___4. The Physical World

Topics: F° to C° (Fahrenheit to Centigrade)
C° to F° (Centigrade to Fahrenheit) pages 255-256

___5. Science: A Key To The Future

Topic: How Heat Is Measured pages 252-254

___6. Cambridge-Work-A-Text

Physical Science

Topic: Measuring Temperature page 110

___7. Modern Physical Science

Topic: Temperature Scales pages 248-249

___8. What Is Heat

Topic: Thermometers page 21

Tapes: (1) Temperature Measurement
(2) Temperature Conversion: Fahrenheit to Centigrade
(3) Temperature Conversion: Centigrade to Fahrenheit

Experiments:

(1) Using the Platform Balance
(2) Using the Graduated Cylinder
(3) Using the Thermometer

Section II

Self-Evaluation

Objective 1

1. Name at least 10 scientific apparatus which you will be using during the year.

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

2 2. Weigh out 15 grams of table salt.

3 3. Measure 15 ml. of water using the graduated cylinder (make a sketch showing where the meniscus would appear).

5 4. Using the centigrade thermometer record the temperature of 20 ml of tap water (water from the faucet)_____ °C.

7 5.a Change 100°c to Fahrenheit reading_____ °f.

5b. Change 212 °f to Centigrade reading _____ °c.

Section II

Advanced Study

___1. Make a poster titled: Temperature Scale Conversion-(include the formula for the conversion and a problem that has been solved.

___2. Make a report on any of the following topics:

1. temperature scales
2. measuring heat
3. Kelvin scale
4. thermometers

___3. See the teacher about your particular point of interest related to the Behavioral Objectives

Behavioral Objectives:

After using the prescribed resources you will on the progress and/ or the LAP test:

1. Describe how and filter a solution using filter paper, a funnel, beaker, and a solution.
2. Name and state the function of the parts of a bunsen burner.
3. State how to cut, bend and polish (smooth) rough edges of glass tubing, by observing the demonstration on cutting, bending and polishing glass.
4. Set up the apparatus for collecting a gas by the water displacement method.

Section III

Resources

Readings and Problems

___Exploring Physical Science

Topic(s)-Working with glass tubing page 471

-Working with gases page 474

Filtering liquids page 472

___The World Book Encyclopedia

Book B- Volume 2

Topic: Bunsen Burner page 588

___Exercises and Experiments in Chemistry

Topic Laboratory Procedures page(s) 119-125

___Tape: Lecture: Glass Manipulations

___Demonstrations: 1. Lighting The Bunsen Burner

2. Cutting, bending and polishing glass

3. Setting up apparatus to collect gas

Section III

Self Evaluation

Objective

1 1. List in order the basic steps involved in filtering solutions.

1. 3. 5.

2. 4. 6.

2 2. State the function of the following parts of a Bunsen Burner.

1. Barrel
2. Air ports
3. Needle valve
4. Base
5. Oxidizing flame

3 3. Briefly state how you

1. cut glass

2. polish glass

4 4. List the basic involved when collecting a gas by the water displacement method.

1.
2.
3.
4.

Section III

Advanced Study

____From the enclosed sheet on "Techniques and Safety Sketches" prepare a poster including at lease 3 of the sketches.

____Perform a demonstration for the class on either of the safety sketches enclosed. (See the instructor)

____Perform a demonstration on "How to set up apparatus to collect gas by the water displacement method."

____Demonstrate for the class the proper way to "cut" glass.

____Explain to the class procedures for either polishing or bending glass.

____Prepare a poster on "The Bunsen Burner and lable the parts.

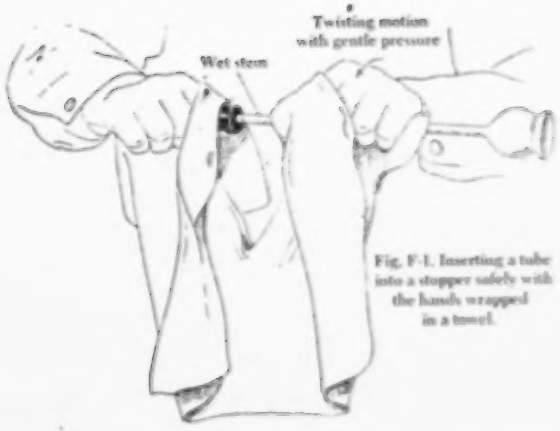


Fig. F-1. Inserting a tube into a stopper safely with the hands wrapped in a towel.

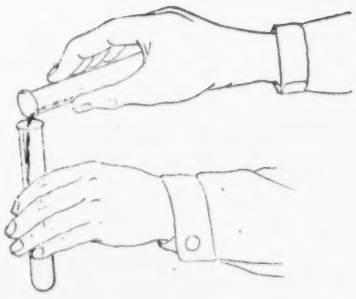


Fig. F-2. Transferring a liquid safely at arm's length.

Fig. F-3. Pouring an acid into water safely.

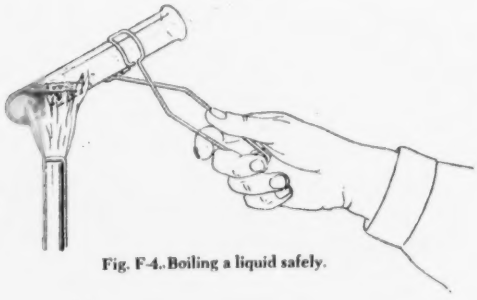


Fig. F-4. Boiling a liquid safely.

Fig. F-5. Investigating an odor safely.

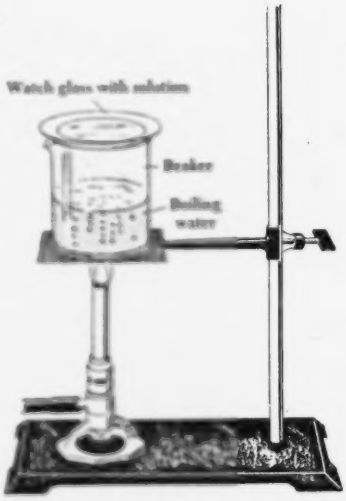


Fig. F-6. Evaporating over a water bath.

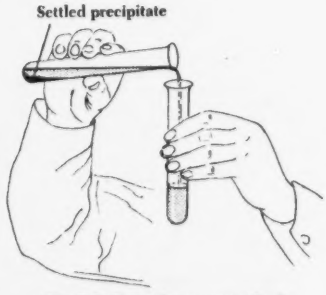


Fig. F-7. Decanting a supernatant liquid without a stirring rod.

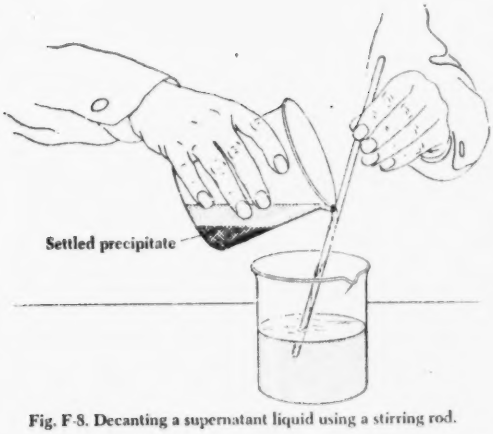


Fig. F-8. Decanting a supernatant liquid using a stirring rod.

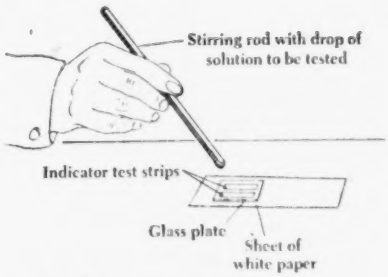


Fig. F-9. Testing a solution with indicator paper.

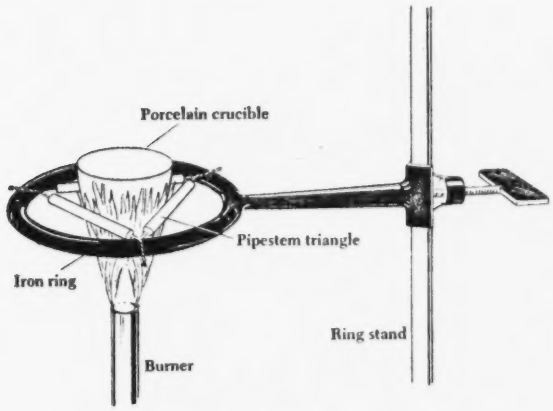


Fig. F-10. Heating a substance in a crucible.

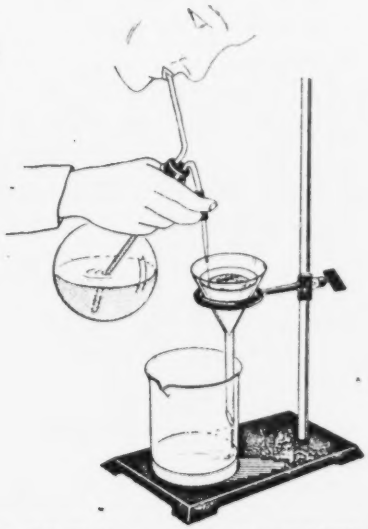


Fig. F-11. Washing a precipitate using a wash bottle.

Fig. F-12. Using a wash bottle.

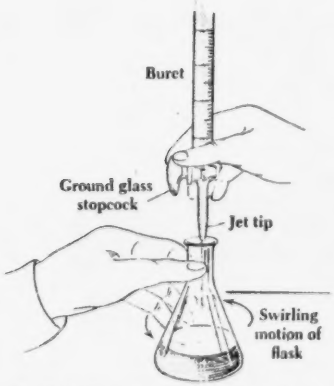


Fig. F-13. Titrating a solution using a buret.

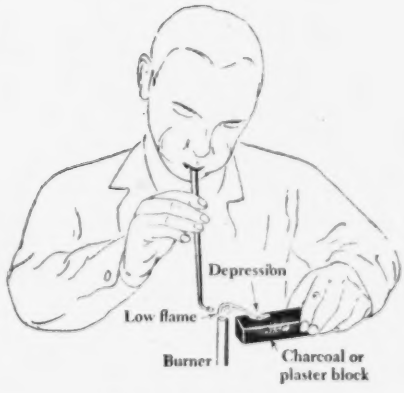
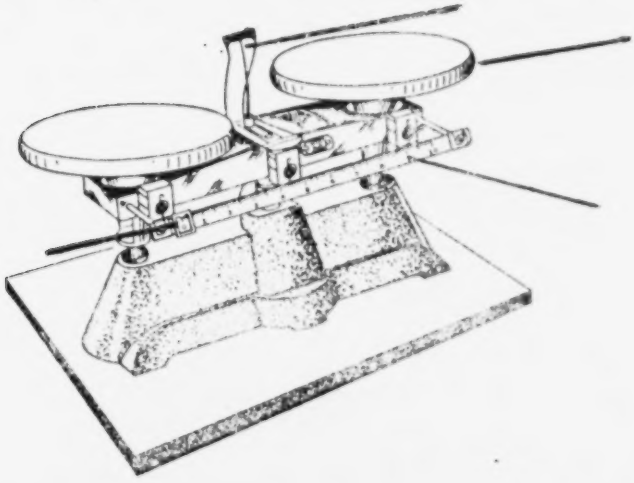


Fig. F-14. Using a blowpipe.

Using The Platform Balance

LABEL This Drawing



Procedure

Inspect your platform balance for cleanliness and your pointer to see if it swings. Place your weighing paper on the left platform. Determine the rest point. (The rest point is the point where the pointer stops swinging.) Put the given amount of material which is to be weighed on the paper, which is on the left platform. On the right platform place a known mass weight(s). If the pointer swings more to the right of the rest point remove the weight and add a smaller weight. If the pointer swings more to left of the rest point remove the weight and add a heavier weight. Continue to do this until the pointer swings equal divisions on each side of the rest point. If you have added the smallest weight available then it will be necessary to move the slider until the pointer moves equal distances to the right and left of the rest point.

Experiment

You will now practice weighing objects using the platform balance. You will practice using given amounts of

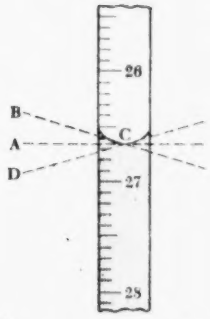
1. Table salt _____
2. Baking soda _____
3. Sand _____

Record the data:

First Trial	Second Trial
1._____	1._____
2._____	2._____
3._____	3._____

Using The Graduated Cylinder

Graduated Cylinder



Eye Levels

Graduated Cylinder

For approximate measurements when measuring liquids in the laboratory a graduated cylinder is generally used. These cylinders are usually marked off in milliliters. Milliliters are units of volume in the metric system. A graduated cylinder may be marked off as follows: 0 to 10ml., 0 to 25ml. or 0 to 50ml. Ml is the abbreviation for milliliter.

Place some water in a graduated cylinder. Observe that the surface of the water is slightly curved. It makes a sort of U shape. This curved surface is called a meniscus(C-above). When measuring using the graduated cylinder you read the bottom of the meniscus (curve). Your eye must be looking along the horizontal line (A-above). If you look along B or D you will get an incorrect reading.

Experiment

Using the Graduated Cylinder measure the following amounts of water:

1. 5 ml
2. 15 ml
3. 18 ml
4. 25 ml

Record the readings of some given amounts of water and alcohol.

_____1. water

_____2. alcohol

_____3. water

_____4. alcohol

Reading The Thermometer

Draw a thermometer and lable the Fahrenheit and Centigrade scale(s).

Place six cubes of ice in a beaker. Place the bulb of a centigrade thermometer in the ice. Read and record the temperature in centigrade _____^{o}c. Let the thermometer stay in the ice for the following time intervals and record the temperature

_____2 minutes_____5 min, and _____8min. Add 25 ml of water and stir until the ice melts, then transfer the liquid to another beaker. Record the temperature after you transfer it _____. Place theliquid on a hot plate and set the dial on medium. Heat the liquid and record the temperature for the following time intervals.

_____2min. _____5 min. and _____8 min.

Thermometer Scale Conversion

State the formula you would use to change Fahrenheit readings to centigrade readings

_____.

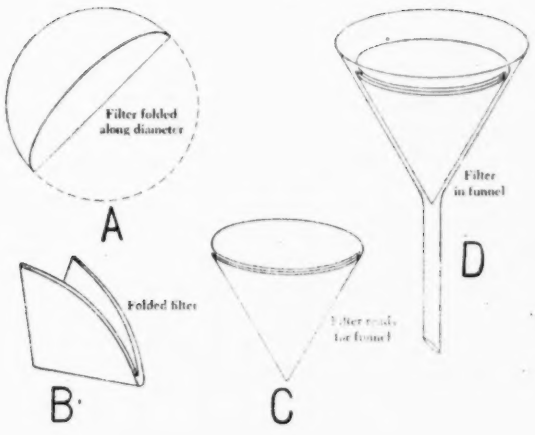
Change the following Fahrenheit readings to Centigrade.

1. 212°f _____°c
2. 68°f _____°c
3. 122°f_____°c
4. 106°f _____ °c

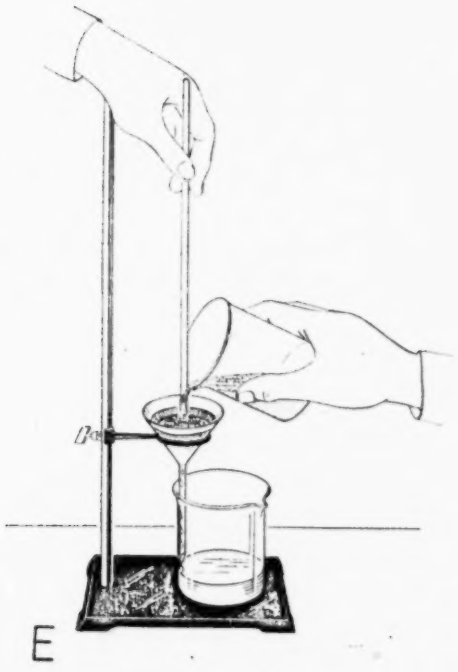
State the formula you would use to change the following centigrade readings to fahrenheit readings.

1. 100°c _____°f
2 10°c _____°f
3. 50°c _____°f
4 37°c _____°f

Filtering Solutions



Preparation for filtering



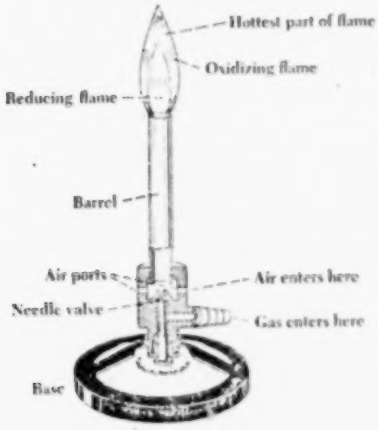
Filtering

Fine particles which settle slowly are often separated from a liquid by filtration. Filtration is the process of separating a solid from a liquid in a solution. When preparing to filter, fold the filter paper in half as in (A). Fold again as in (b). Spread apart one of the curved edges as shown in (C) to from a coned shaped cup. Moisten the inside of a glass funnel with a few drops of water; insert the cone shaped cup in the funnel; press the edges of the cup against the inside of the funnel to provide a good seal (D), then pour the liquid that is to be filtered into the funnel as shown in diagram.

Experiment

Mix thoroughly 3 grams of sand in 10 ml of water and using the procedure given, filter the solution.
Record step by step procedure that you use.

Using The Bunsen Burner



The bunsen burner is a gas burner used for heating substances in the science laboratory. In lighting the burner. Partially close the air ports at the base of the barrel, turn the gas full on, and hold a match about 5 cm above the top of the burner. The gas may then be regulated until the flame has the desired height.

Note: (This will be a demonstration <u>do not attempt to light the bunsen burner your self</u>!!!!!)

Get a bunsen burner from the cabinet and locate the parts that are shown above.

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LAP

LEARNING
ACTIVITY
PACKAGE

THE METRIC SYSTEM

Ninety Six High School
Ninety Six, S.C. 29666

PHYSICAL SCIENCE 93-94

REVIEWED BY _____

LAP NUMBER 2

WRITTEN BY C. J. Williams

SE 016 422

RATIONALE

Since some phases of physical science use mathematics to answer certain problems, it is important that you become familiar with the systems of measurement. There are two different systems of measurement used throughout the world, the English and Metric systems.

The English system, commonly used in the United States, is basically used for everyday measurement. Some common units in this system are inch, pound, and gallon.

The Metric system is presently used by scientists all over the world and its general use is rapidly increasing; therefore, we should become familiar with it. Some common units in this system are meter, gram, and liter.

In this LAP you will learn the fundamentals of measurement using the metric system. You will not only learn to measure length and weight, but also calculate area, volume, and density.

The study of the metric system will benefit you greatly as you proceed to study the two basic divisions of physical science--physics and chemistry.

SECTION I

Behavioral Objectives

After you have completed the prescribed resources, you will be able to(on the LAP and/or Progress Test):

1. Define the following terms:

   a. length
   b. volume
   c. density
   d. area
   e. weight
   f. mass
   g. meter
   h. gram
   i. liter
   j. cubic unit
   k. square unit

2. Identify the following metric prefix meanings:

   a. kilo
   b. hecto
   c. deca
   d. deci
   e. centi
   f. milli

3. Write the abbreviation for the following terms:

   a. millimeter
   b. centimeter
   c. decimeter
   d. decameter
   e. hectometer
   f. kilometer
   g. meter
   h. liter
   i. milliliter
   j. cubic centimeter
   k. square centimeter

4. Name the three fundamental units of measurement in the metric system.

5. Name the basic unit of length, weight, and volume in the metric system.

6. Measure the lengths of given line segments and objects, using a ruler marked off in metric units.

7. Construct line segments from given data using metric units.

RESOURCES

I. Readings and Problems

A. Science:

A Search for Evidence, Topic: Measuring Things, pp. 18-19.

B. Science:

A Key to the Future, Topic: How Does Mathematics Aid in Describing Things, pp. 10-13.

C. Modern Physical Science:

Topic: Science and Measurement, pp. 5-9.

D. The Physical World:

Topic: Guide to Scientific Measurement, pp. 624-626.

E. The Dictonary:

F. Exploring Physical Science:

Topics: The Metric System, Table of Metric Prefixes, p. 485.

II. Audio-visual

A. Filmstrip: The Metric System

III. Games

A. Matching symbols with terms

B. Identifying prefixes with meaning

IV. Experiments

A. Measuring length with a meter stick

B. Data from which you are to construct line segments

V. Activities

Complete the "Self-Discovery Activities"
(a). Measuring length in The Metric System page 15 of the Cambridge Work-A-Text Physical Science

Self-Evaluation

1-1. State a brief definition for the following terms:

a. length

b. volume

c. weight

d. mass

e. density

2-2. Match the prefix with its meaning.

____	1. centi	a.	100
____	2. kilo	b.	.01 or $\frac{1}{100}$
____	3. hecto	c.	.1 or $\frac{1}{10}$
____	4. deci	d.	1000

3-3. Write the abbreviation for the following terms:

____ a. liter

____ b. centimeter

____ c. gram

____ d. meter

3-4. Write the word which has the following abbreviations:

_____ a. cc

_____ b. kg

_____ c. mm

_____ d. ml

4-5. Name the three fundamental units of measurement in the metric system.

a. b. c.

5-6. List the basic unit of the following in the metric system.

_____ a. length

_____ b. weight

_____ c. volume

6-7. Using a meter stick, measure the length of this page and record your answer.

_____

7-8. Using a meter stick, measure the following line segments and record your answers:

a. •————————————• ANSWER _____

b. •————————• ANSWER _____

ADVANCED STUDY

1. Prepare a one page report on "The Metric and English Systems of Measurement."

2. Prepare a poster on one of these topics:
   a. Conversion Factors
   b. Common Metric Units
   c. Metric Prefixes
   d. English and Metric
      1. Units of Length
      2. Units of Volume
      3. Units of Weight

3. Construct a ruler that has the English system measurement on one side and metric on the other.

4. See your teacher about your point of interest.

SECTION II

Behavioral Objectives

Using the prescribed resources listed, you will on the LAP and/or Progress Test be able to:

1. Calculate the volume of rectangular shaped objects and given rectangular diagrams where the dimensions are given.

2. Determine the volume of irregular shaped objects using water, overflow can, and a graduated cylinder.

3. Calculate the area of given objects or diagrams where the dimensions are given.

4. Calculate the density of objects given the weight and volume.

RESOURCES

I. Reading and Problems

A. The Physical World, Topic: Units for Measurement of Volume, p. 625.

B. Modern Physical Science, Topics: The Metric Unit of Volume
Determination of Volume, pp. 8-9.

C. Science: A Key to the Future, Topic: How Does Mathematics Aid in Describing Things, pp. 10-13, and 16.

D. Physical Science for Progress, Topics: Density is Weight Per Unit of Volume, The English System, The Metric System Is Easy to Use, pp. 142-143.

E. Cambridge Work-A Text Physical Science, Topic: Measuring Area in the Metric System, pp. 12-13.

II. Handouts

Diagrams with given dimensions to calculate volume, area and density.

III. Audio-Visual

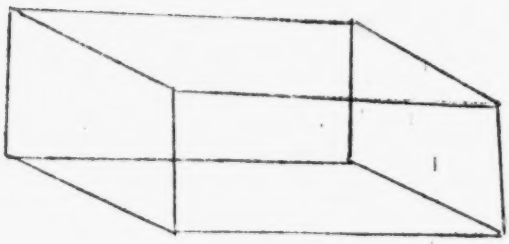
Filmstrip: Measuring Volume and Density

Tape: "How to Calculate Volume, Area, and Density"

IV. Experiments

Determining volume and density of objects.

Self-Evaluation II



A. If the box above is 5 cm long, 2 cm high, 3 cm wide, and weighs 6 grams. Calculate:

1. volume _____

2. area _____

3. density _____

B. State the procedure you would use to find the volume of an irregular shaped object.

ADVANCED STUDY II

1. Prepare a poster which displays formulas for calculating area, volume, and density.

2. Demonstrate how to find the volume of irregular shaped objects to the class.

3. Prepare a chart on units of volume.

4. Make a display of objects for which you have determined the density.

5. Make a display of objects for which you have determined the volume.

6. Write a report on "How Temperature Affects the Volume of Solids, Liquids and Gases."

SECTION III

Behavioral Objectives

Using the prescribed list of resources, you will, on the Progress and/or LAP Test, be able to:

1. Determine the weight of objects in the metric units using the spring balance.

2. Change measurement from the English system of measurement to the Metric system of measurement.

3. Change measurement from the Metric system of measurement to the English system of measurement.

4. Change measure from one unit in the metric to another unit in the metric system.

RESOURCES

I. Readings and Problems

A. Modern Physical Science, Topic: What Is Weight, pp. 5-6.

B. Science: A Search for Evidence, Topics: The Metric System, Changing from One System to the Other, p. 19.

C. The Physical World, Topic: Changing from One System to the Other, p. 625.

D. Science: A Key to the Future, Topic: Weighing Matter, pp. 20-21.

E. Exploring Physical Science, Topics: The Metric System, An Advantage of the Metric System, Table of Measurements, Converting from English to Metric, pp. 485-486.

II. Hand-outs

A. Data to Change from English System to Metric System

B. To Change from the Metric System to the English System

C. To Change from Units in the Metric System to other Units in the Metric System

III. Tapes-Audio-Visual

Wollensak Teaching Tape, "The Metric System", (complete the worksheet).

IV. Experiments

Using the Spring Balance.

V. Activities
Using the Cambridge Work-A-Text Physical Science page 17
Complete the following problems 3,4,7,8,11,12 and 15.

Self-Evaluation III

1. If 1 inch = 2.54 cm. How many centimeters are in 4 inches?

2. If 28.3 grams = 1 ounce. How many ounces are in 84.9 grams?

3. Change 2.5 kilometers to meters if 1000 meters = 1 kilometer.

4. Change 2,500 meters to millimeters if 1 meter = 1000 millimeters.

ADVANCED STUDY III

1. Make a poster on "Converting From English to Metric". Include weight, length, and volume units.

2. Demonstrate how to use the spring balance to the class.

3. Make a chart to show how to solve problems on one of these topics:
   a. changing measurement from the English to the Metric System.
   b. changing measurement from the Metric to the English System.
   c. changing metric units to other metric units.

4. Make a game related to any aspect of the Metric System that interst you most.

EXPERIMENT
"Using the Spring Balance"

The spring balance that is used in many science laboratories is marked off in grams (Gm) and ounces (oz.). It is one of the devices that can be used to measure the weight of an object.

PROCEDURE:

Take a clothes hanger, turn it upside down and hang it on the hooks at the top of the chalkboard. Attach the top of the spring balance to the hook of the hanger. Using a strong string, attach the following objects to the bottom of the spring balance and record the weight of each in metric units.

a) a bolt b) 50 gram weight c) nail

RECORD your data.

OBJECT	WEIGHT
bolt	
50 gram weight	
nail	

EXPERIMENT

"Measuring with a Meter Stick"

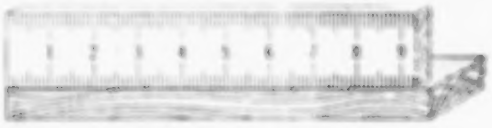


Fig.1-1

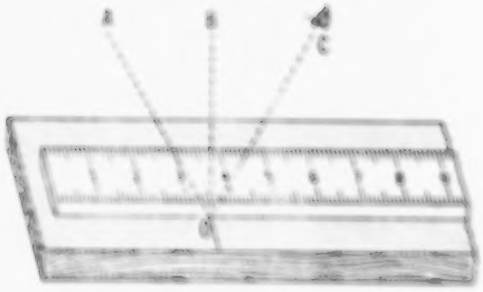


Fig. 1-2

In making measurements of length with a meter stick, the meter stick should be placed on its edge as shown in figure 1-1. If the meter stick lies flat on a table, as shown in figure 1-2, the scale is so far from the table that it is possible to make a variety of readings. If you look along the line AO, the reading of the line on the table appears to be at the 3.3 cm division of the meter stick. If you look along the line CO, the reading now appears to be 3.7 cm. Both readings are in error because of parallax. Parallax is the apparent movement of the line, with respect to the markings on the meter stick, which occurs as the eye of the observer moves from A to C. The correct reading, 3.5 cm, is obtained only when one looks along the line BO. Errors due to parallax are avoided if the meter stick is placed on its edge when making measurements.

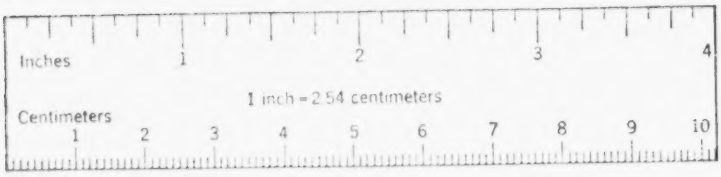
PROCEDURE IS ON THE BACK OF THIS PAGE.

EXPERIMENT (cont')

"Measuring With the Meter Stick"

PROCEDURE:

Examine your ruler and determine which side is marked off in metric units.



---ENGLISH SYSTEM UNITS

---METRIC SYSTEM UNITS

Using the side marked off in metric units, measure and record the length of the following objects:

a. Across the center of your desk _____

b. length of your textbook _____

c. length of your notebook _____

d. length of the following line segments:

1. •———• ANSWER _____

2. •———• ANSWER _____

3. •———• ANSWER _____

e. Construct line segments for the following lengths:

1. 2 cm.

2. 3.3 cm.

3. 1.5 cm.

EXPERIMENTS

"Volume and Density"

PART I - Determining the volume of rectangular shaped objects.

Objects: Shoe box, your textbook, baking soda box

PROCEDURE:

State the formula for determining the volume of rectangular shaped objects. Measure the length, width, and height of each object. Substitute these measurements in the basic formula and multiply as indicated by the formula.

RECORD your data as follows:

OBJECT	LENGTH	WIDTH	HEIGHT	VOLUME

PART II - Determining the Volume of irregualr shaped objects.

Objects: rock, screw, and a bolt.

PROCEDURE:

Fill an overflow can with water. Let the water drain down to the level of the spout. Place a graduated cylinder under the spout. Carefully lower the object into the can, catch the overflow of water in the graduated cylinder. Measure the water in the graduated cylinder. Record this as the volume of the object.

RECORD your data as follows:

OBJECT	VOLUME	OBJECT	VOLUME

EXPERIMENT (cont.)

PART III - Determining the Density of Objects

Objects: Shoe box and rectangular shaped block

PROCEDURE:

State the formula for calculating density. Find the weight of each object. Find the volume of each object. Substitute your findings (weight and volume) in the formula and calculate the density.

RECORD your data as follows:

OBJECT	MASS	VOLUME	DENSITY

ED 086476

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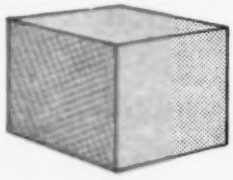
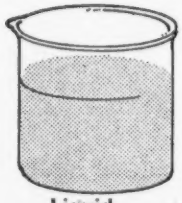
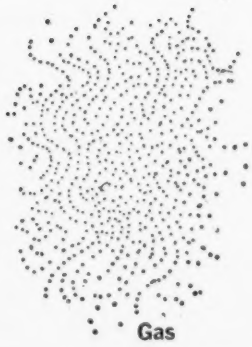
LEARNING ACTIVITY PACKAGE

MATTER AND ENERGY

THE THREE STATES OF MATTER







Solid	Liquid	Gas
Definite shape	Definite space	No definite shape
Definite space	No definite shape	No definite space

Can matter be changed from one state to another?

Ninety Six High School - Ninety Six, S.C.

PHYSICAL SCIENCE 93-94

REVIEWED BY J. Rutledge

LAP NUMBER 4

WRITTEN BY G.J. Williams

SE 016 422

21872

Rationale

Men, animals, plants, bacteria, air and the heavenly bodies are all different forms of what scientist call matter.

We should have no difficulty in recognizing the different forms of matter. We can see and touch solids and liquids. We know they possess weight. It might not be as easy to recognize the gaseous state of matter because many gases are invisible. Yet if you blow against the palm of your hand, you can feel the on rush of the gases from your lungs. Experimentation has proven that air has weight.

Our last LAP dealt with the study of the composition and structure of matter, molecules, atoms and elements.

In this LAP we will study about the phases, properties and changes of matter. We will conclude this LAP with the study of forms, kinds and the transformation of energy.

The knowledge you gain in this LAP will make it easier for you to understand the nature of hydrogen and oxygen and how they combine to form water. This we will consider in our next LAP.

Section I

Behavioral Objectives

Using the prescribed resources listed you will on the Progress and/or LAP Test:

I. Define the following terms:

1. Matter
2. Physical change
3. Chemical Change
4. Nuclear Change

II. List the names of the three basic phases of matter.

III. State characteristics, related to molecular arrangement, which specify matter as solid, liquid or gas.

IV. Classify examples of matter as solid, liquid or gas.

V. State the basis for changing matter from one phase to another.

VI. Classify given reactions as physical, chemical or nuclear charges.

VII. Classify given properties as being physical or chemical properties of matter.

Resources

Readings and Problems

1. Modern Physical Science

   Topic- Matter and Its Changes- page 9-11

2. The World Book Encyclopedia

   Volume 13 Book M

   Topics: (1) Matter- page 246

   (2) Properties of Matter- page 246

   (3) Structure of Matter- page 247

   (4) States of Matter- page 247

3. Cambridge Work- A- Text

   Physical Science

   Topic (1) States of Matter- page 145

   (2) Properties of Matter- page 145

   (3) Physical and Chemical Changes- pages 145-146

   (4) Matter and Energy- page 146

4. The How and Why of Chemistry

   Topics: (1) What is Matter-page 11

   (2) What Are the Three States of Matter- page 12

   (3) How can you change one state of matter into another state- page 12

5. The Dictionary

   Handouts:

   I. Substances to classify as solids, liquids, or gaseous states of matter.

   II. Reactions to classify as physical, chemical or nuclear changes.

Handouts cont.

3. Properties to classify as physical or chemical properties of matter.

Tapes, Audio Visuals

Filmstrip: Matter and Molecules

Wallensak Teaching Tape: Changing States of Matter (complete the worksheet)

Transparencies

1. What is Matter (complete student activities)
2. Properties of Matter (complete student activities)
3. Physical Properties of Matter (complete student activities)
4. Chemical Properties of Matter (complete student activities)
5. Types of physical change (complete student activities)

Experiments

1. Changing States of Matter
2. Physical and Chemical Change

ACTIVITIES

1. Use a Cambridge Work-A-Text Physical Science Book: pages 151-152 Under "Multiple Choice Questions" Answer the following Questions 3,5,6,7,8,9,10,11,12,15.
2. Complete the matching exercise page 152 (Work-A-Text).
3. Under completion Questions page 149 in the Work-A-Text answer the following questions: 10,13,14,15 and 17.

Self-Evaluation Section I

1. _____, _____ and _____ are the names of the three states of matter.

2. _____ is defined as a change in which new substances with new properties are formed.

3. _____ is defined as a change in the form of matter which does not produce a new substance.

4. Identify the states of matter by their molecular characteristics.

_____ Are rigid and have definite shape and volume.

_____ Distributes itself uniformly to fill available space.

_____ Flow, take the shape of their container and have a definite volume.

5. Classify the following as solid, liquid or gaseous state of matter.

1. alcohol _____

2. bar of soap _____

3. oxygen you breather _____

4. water _____

5. Ice cube _____

6. Classify the following reactions as physical, chemical, or nuclear changes.

1.Toast that has burned _____ 5.Hydrogen to helium _____
2.Butter that has melted _____ 6.Milk that has soured _____
3.Glass that is broken _____ 7.Candle that has melted _____
4.Iron that has rusted _____ 8.Sugar that has burned _____

7. Name a way to change matter from one state to another. _____

_____

8. Classify the following properties as physical or chemical properties of matter:

   1. color_____
   2. oxygen unites with iron_____
   3. taste_____
   4. electrolysis of water_____
   5. odor_____

Advanced Study

1. Make a chart which shows the three states of matter and their characteristics.

2. Make a display of objects that have undergone physical change and /or chemical change.

3. Make a list of reactions that have been classified as physical or chemical change on poster paper.

4. Make a collection of magazine articles related to one or more of the following topics:
   1. Matter(states)
   2. Physical changes
   3. Chemical changes

(Organize these articles on a poster board)

5. Make a report on one of the following topics: (Use four different resources)
   (1) Matter
   (2) Physical change
   (3) Chemical change

6. Prepare a bulletin board on one of the following:
   (1) matter
   (2) physical change
   (3) chemical change

Section II

Using the prescribed resources listed you will on the Progress and/or LAP test:

1. Define and state two examples for each of the following
   1. Energy
   2. Kinetic energy
   3. Potential energy
   4. Electrical energy
   5. Mechanical energy
   6. Chemical energy
   7. Atomic energy
2. Name the two basic forms of energy.
3. Classify stated conditions of energy as kinetic, potential or nuclear energy.
4. Calculate the amount of kinetic, and the amount of potential energy, given object possess.
5. State the names of four different kinds of energy.
6. Name and identify conditions where one form of energy changes to another form of energy.

Readings and Problems

1. Modern Physical Science

   Topics (1) Sources of Heat-page 253

   (2) What is potential energy-page 229

   (3) What does kinetic energy depend upon-page 230

   (4) Other forms of energy-page 231

2. Science: A Key to the Future

   Topics: (1) Potential Energy-page 52

   (2) Kinetic Energy-page 53

3. Energy and the Atom

   Topics: (1) Energy

   (2) Kinetic Energy-page 120

   (3) Potential Energy-pages 121-123

4. Cambridge Work-A-Text

   Physical Science

   Topics: (1) Kinetic Energy-page 29

   (2) Potential Energy-page 29

5. The Dictionary

   Handouts

   1. Classifying conditions as kinetic, potential or atomic energy.
   2. Problems to solve related to kinetic or potential energy.
   3. Identification of changes in forms of energy.

Tapes and Audio Visual

Transparency: 1. Energy -(complete student activities)

Tape

Lecture "Energy Kinds and Forms

Filmstrip: General Science Part G-Energy

ACTIVITIES

Using Book(3) of the General Science Programmed Learning Laboratory- Energy and Work

Matter In Motion

Complete the following questions

152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, and 163.

and

194, 195, 196, 197, 203, 215, 216, 219, 221, 222, 228, 229, 233, 234, 235, 236, 237, 238 and 240

Self-Evaluation Section II

1._____ is the ability to do work.

2._____ and _____ are the two basic forms of energy.

3. _____ is the form of energy that is due to position or condition.

4._____ is the form of energy that is due to motion.

5. Name four different kinds of energy.1._____

2._____ 3._____

4._____

6. Classify the following conditions as kinetic energy or potential energy.

1. rock on top of a cliff_____

2. dynamite explodes_____

3. running stream of water_____

4. Water behind a dam_____

7. Solve the following problems:

1. What is the potential energy of a block which weighs 25 lb. when it is placed on a ladder 10 feet from the ground?_____

2. A 10 lb. object moves with the speed of 15 ft/sec. Find the kinetic energy of the body_____

8. What changes in forms of energy are represented by the following:

1. When wood burns_ _____

2. An electric light is turned on_____

3. Toaster is turned on_____

4. Gasoline engine starts_____

Advanced Study

1. Make a report on one of the following topics: (present the report to the class)
    1. Energy (general information)
    2. Kinetic energy
    3. Potential energy
    4. Heat energy
    5. Atomic energy
2. Make a poster which displays a change in several forms of energy
3. Make a chart which displays the names of the two basic forms of energy, an example of each form and the formula which is used to solve problems related to each form.
4. Collect magazine articles which displays different kinds of energy and organize the kinds under their proper name on a poster, or display.
5. Make a bulletin board on potential and/or kinetic energy.
6. Make a game related to one of these topics.
    1. Energy
    2. Potential energy and kinetic energy
    3. Potential energy
    4. Kinetic energy.

Section III

Using the prescribed resources you will on the Progress and/or LAP Test be able to:

1. Distinguish between the following terms:

   (a) calorie (b) BTU

   (a) Heat of fusion (b) Heat of vaporization

2. State what happens in terms of calories of heat when the following occurs:

   (a) Ice at $0^{\circ}C$ changes to a liquid
   (b) A liquid which has melted begins to boil
   (c) Boiling water changes to steam

3. State what is meant by the specific heat of a substance and its significance.

4. State the significance of calories and btu's in relation to heat.

5. Demonstrate how the specific heat of a substance can be determined.

6. State the formula and calculate the number of calories of heat is necessary to change a given amount of ice to a liquid.

7. State the formula and calculate the number of calories of heat necessary to change a liquid from a given temperature to its boiling point.

8. State the formula and calculate the number of calories of heat necessary to change a given liquid to its steam point.

9. Calculate the amount of heat needed to heat given substances from one given temperature to another.

Resources Section III

Readings and Problems

1. The Dictionary
2. Modern Physical Science

   Topics: (1) Calories Measure the quantity of heat page 257

   (2) What is the specific heat of substance page 257-259

   (3) Heat accounts for melting and boiling page 259-261

3. World Book Encyclopedia

   Volume 9 Book H

   Topics: (1) Changes made by heat page 145

   (2) How heat is measured page 146

4. The Physical World

   Topic: What Is Heat pages 240-244

Handouts

Problems to calculate number of calories of heat

I. required to melt given amounts of ice

II. required to get given amounts of a liquid to its boiling point.

III. required to get given amounts of a liquid to its steam point.

Tapes-Audio Visuals

1. Lecture: Heat of Fusion and Heat of Vaporization

Transparencies

(Sample problems) on calculating number of calories of heat needed to get a liquid to tis

1. Melting point
2. Boiling point
3. Steam point

Activities

1. Using the Modern Physical Science textbook pages 276-277
   Complete the matching exercise for the following.
   1, 2, 3, 4, 5, 6, 7, 8, 9, and 10

2. Using the Modern Physical Science textbook-
   pages 277-278 Under questions Group B
   answer the following questions 6, 7, and 9
   Under questions: Group A question 9

Problem: How much heat energy is required to change 15 grams of ice at $0^{\circ}C$ to steam at $100^{\circ}C$?

I. How much heat energy is needed to melt the ice?_____

II. How much heat energy is needed to heat the water from $0^{\circ}C$ to $100^{\circ}C$ (its boiling point)? _____

III. How much heat energy is needed to change the water after it reaches its boiling point to steam?_____

IV. What is the total number of calories needed for the entire process of melting, boiling, and steaming?_____

V. How much heat energy is needed to heat 1050 g of lead from 25° C to 285° C. If the specific heat of lead is 0.03 cal/g C°?
_____

VI. Determine the number of calories of heat required to change 40 grams of water at 20° C to steam at 100° C._____

VII. List the names of two units which can be used to measure heat. 1._____ 2._____

VIII. Distinguish between the following terms.

1. Heat of fusion 2. Heat of vaporization

IX. How much heat energy must one gram of water at 0° C absorb before melting? _____

X. State the formula you would use to determine the amount of heat needed to get a substance to its boiling point?

XI. How much heat energy must be absorbed by water at 100° C or 212° F to convert it to steam?

Advanced Study

1. Make a diagram which displays what happens when one gram of ice receives 80 calories of heat and what happens when one gram of water gives up 80 calories of heat.

   and/or

   When one gram of boiling water receives 540 calories of heat and what happens when one gram of steam gives up 540 calories of heat.

2. Prepare a poster which shows a problem solved on one or more of the following topics. Calculating the number of calories necessary to get a liquid to its
   (1) Melting point
   (2) Boiling Point
   (3) Steaming Point

3. Demonstrate to the class how to calculate the melting, boiling, and/or steaming point for a liquid.

4. Make a report on one of the following topics:
   1. Heat of fusion
   2. Heat of vaporization
   3. Calories and BTU's

Section IV

Using the prescribed resources listed you will on the Progress and/or LAP Test:

1. Define the following terms:
    1. Expansion
    2. Contraction
    3. Coefficient of volume expansion
    4. Coefficient of linear expansion
    5. Conduction
    6. Convection
    7. Radiation

2. State the effect that sudden heating and sudden cooling has on an object and why.

3. Calculate the amount of volume expansion that takes place within a given material, when the name of the material, expansion coefficient and temperature changes are given.

4. Calculate the amount of linear expansion that takes place with given materials, when the name of the material, linear coefficient and temperature changes are given.

5. Name and give examples for the three different types of heat transfer.

Resources Section IV

Readings and Problems

1. The Dictionary

2. Modern Physical Science

Topics: (1) Heat causes substances to expand page 253.

(2) The coefficient of volume expansion pages 254-255

(3) The coefficient of linear expansion pages 255-256.

3. World Book Encyclopedia

Volume 9 Book II

Topics: (1) What Heat Does page 144

(2) Expansion page 145

4. Cambridge Work-A-Text

Physical Science

Topics: (1) Measuring- page 110

(2) Heat Transfer page 111

(3) Effects of Heat Energy page 111

Handouts

I. Problems on volume expansion

II. Problems on linear expansion

Tapes-Audio -Visuals

Tape: Lecture; Coefficient of linear and expansion

Filmstrip: How Heat Is Measured

Transparencies

1. Coefficient of Linear Expansion

2. Specific Heats of Some Common Substances

Experiments

1. Gases Expands when Heated

2. Liquids expands when heated

Activities

Using the Modern Physical Science textbook Under Questions

Group A Answer the following questions: 4, 7

Under Questions Group B

Questions 3, 4, 6, 8

Self-Evaluation Section IV

1. How much does the volume of 50 liters of water increase when heated from 10°C to 60°C? The coefficient of volume expansion for water is 0.00019/c°._____

2. A steel rail is exactly 39 feet long at 0°C. What will be the increase in length on a day when the temperature is 25°C if the coefficient of linear expansion for steel is 0.000013/c°.

   a. amount of increase_____

   b. New length_____

3. Why are spaces left between the rails on a railroad track?

4. Name three different types of heat transfer and give an example for each type.

Name	Example
1.	
2.	
3.	

5. Why is it that when you place hot water in an ordinary cooled glass the glass will sometimes break?

Advanced Study

1. Make a poster on one of the following topics:
   1. The effects of heat
   2. Methods for heat transfer
   3. Conduction
   4. Radiation

2. Make a report on one of the following topics:
   1. Conduction
   2. Radiation
   3. Convection
   4. Heat and expansion

3. Demonstrate the effect sudden heating has on a cooled object and explain the results.

4. Demonstrate to the class how to solve problems related to volume and linear expansion.

5. Prepare a poster with solved problem on linear and/or volume expansion.

6. Prepare a chart listings some linear expansion coefficients for some common materials.

7. Explain why beakers, laboratory glassware and pyrex glass does not break as readily as ordinary glassware.

Experiment

Physical and Chemical Changes

Materials: Table salt, mortar and pestle, evaporating dish, beaker, balance, tripod, copper sulfate, iron nail.

Procedure: Part I

(1) Examine some table salt and record its color and taste

color_____ Taste_____

(2) Pulverize some of the salt in a mortar and again record its color and taste.

color_____ taste_____

(3) Dissolve and heat 4 grams of the pulverized salt in a beaker containing 15 milliliters of water. Stir the solution and, after it has cooled, taste a drop of the liquid and record the results.

Taste_____

(4) Heat 8 milliliters of this solution in an evaporating dish and boil until all the liquid is evaporated. When cooled taste the remains, record results

Taste_____

Conclusions:

1. Does this experiment represent a physical or a chemical change?_____

2. State the reason for your conclusion

_____

_____

Procedure: Part II

1. Prepare a dilute(weak) solution of copper sulfate by dissolving a few large crystals of copper sulfate in 100 ml. of water and then heat.
2. After the solution has cooled, place a new shiny nail in it.
3. Record the following observations:

Time	Color of Solution	Appearance of Nail
at start		
after 15 minutes		
after 24 hours		

Conclusion:

1. Does the reaction in Part II represent those of a physical or chemical Change?_____

2. State the reasons for your conclusion.

3. What is the coating on the nail and where do you believe it came from?_____

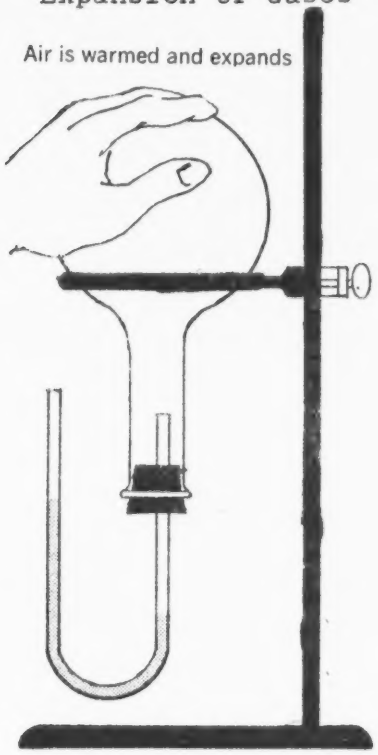
_____

EXPERIMENT

Expansion of Gases and Liquids

Part I

Expansion of Gases



Set up a flask as shown above. Add a little colored water to the glass bend. Now put your hand on the flask for a minute or two.

Record your observations:_____

_____

Conclusion_____

_____

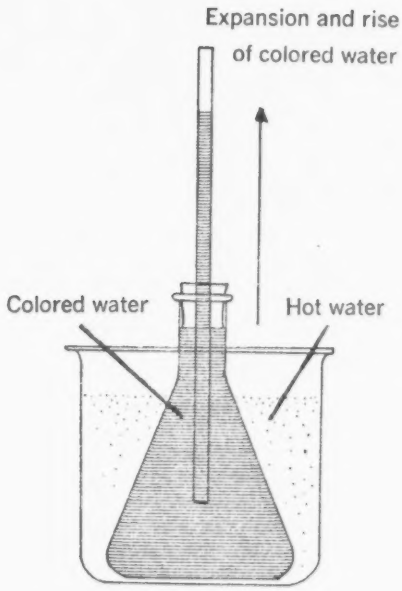
Remove your hand and observe for three minutes. Record your observation_____

Conclusion_____

EXPERIMENT

Part II

Expansion of Liquids



Fill a flask with colored water and put in a rubber stopper and a glass tube as shown above. Mark the height of the colored water in the tube. Heat the flask by putting into some hot water for 5 minutes. Observe:

Record your observations:_ _____

_____

Remove the flask from the beaker of hot water and place it in a beaker of cold water for 8 minutes. Observe:

Record observations:_____

_____

Conclusion:_____

_____

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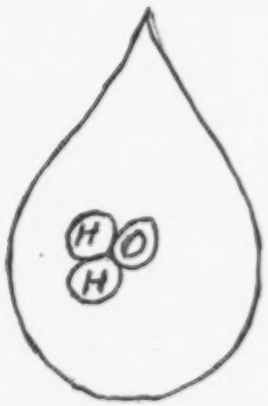
LEARNING ACTIVITY PACKAGE

ATOMS MOLECULES ELEMENTS



A drop of water contains more than 33 billion billion molecules. Each of these molecules is made up of three atoms, two of hydrogen and one of oxygen.

Ninety Six High School
Ninety Six, S.C.

PHYSICAL SCIENCE 93-9

REVIEWED BY

LAP NUMBER 3

WRITTEN BY G.J. Williams

SE 016 422

RATIONALE

Everything around you is made of extremely tiny particles (the chair on which you sit, the air you breathe, the pages of this LAP, rocks, grass, and trees. Your body is a complicated, organized collection of billions and billions of these particles (atoms).

There are more than a hundred different kinds of elements. First we must understand the structure of the atom then we will learn how to predict the properties and chemical behavior of the elements.

In this LAP we will study atoms; atomic structure and how atoms combine to form molecules and compounds.

The knowledge you gain in this LAP will be of great benefit in your understanding of Matter and Energy, our next LAP.

SECTION 1

Behavioral Objectives

Using the prescribed resources, you will on the PROGRESS and/or LAP TEST be able to:

1. State a definition for the following terms:

   a. nucleus
   b. proton
   c. neutron
   d. electron
   e. shell
   f. atom

2. Name the three fundamental parts of an atom.

3. Locate the three fundamental parts of an atom on an atomic diagram.

4. State the charge and symbol for each fundamental part of an atom.

5. Name the first five main energy levels and the maximum number of electrons each shell will hold.

6. Give the symbol and/or name for at least twenty-five of the thirty elements on the handout on elements.

RESOURCES

I. Readings and Problems

   A. The Dictionary

   B. The Physical World, Topic: Meet the Atom, pp. 110-129.

   C. Energy and the Atom, Topic: The Structure of the Atom, pp. 41-60.

   D. Science: A Key to the Future, Topic: Kinds of Electrical Charges, pages 33-38.

   E. Modern Physical Science, Topic: The Structure of an Atom, pp. 20-23.

   F. Cambridge Work - A - Text, Physical Science, Topic: Structure of the Atom, pp. 153-154.

II. Handout

   Elements to Learn, Name, and Symbol

III. Audio-Visuals

   A. Teaching Tape: The Elements (complete the worksheet)

   B. Filmstrip: (1) What Are Elements and Compounds
      (2) Atoms and Atomic Energy

Self-Evaluation I

1-1, Briefly define the following terms:

a. atom

b. proton

c. electron

d. neutron

4-2. List the name, charge, and symbol for each of the three fundamental parts of an atom.

NAME	CHARGE	SYMBOL
A.		
B.		
C.		

3-3. State where each of the fundamental parts of an atom is located on an atomic structure.

NAME	LOCATION
a.	
b.	
c.	

5-4. List the name for the first five energy levels and the maximum number of electrons each energy level (shell) will hold.

ENERGY LEVEL	MAXIMUM NUMBER OF ELECTRONS
A.	
B.	
C.	
D.	
E.	

6-5. Give the symbol for the following elements.

a. hydrogen _____

b. calcium _____

c. magnesium _____

d. sodium _____

e. nitrogen _____

6-6. Give the name of the elements that has these symbols.

a. O _____

b. Cl _____

c. K _____

d. S _____

e. He _____

ADVANCED STUDY I

1, Make a poster which shows a diagram of an atomic structure for a particular element.

2. Make a model of an atomic structure.

3. Make a report on one of the following topics:

   a. The Proton

   b. The Electron

   c. The Neutron

4. Make a chart which shows the name of the three fundamental parts of an atom, who they were discovered by, and their general properties.

5. Make a poster which shows the names of at least twenty elements and their symbol.

6. Make a game related to atomic structure.

SECTION II

Behavioral Objectives

Using the prescribed resources, you will on the Progress and/or LAP Test be able to:

1. State a definition for the following terms:
   a. element
   b. periodic chart
   c. atomic number
   d. atomic weight
   e. isotope
   f. ion
2. Locate the atomic number and atomic weight for elements on the periodic chart.
3. Determine the number of protons, electrons, and neutrons for any element, given atomic weights, atomic numbers, and the periodic chart.
4. Draw orbitals diagrams of atomic structures and distribute electrons on the main energy levels (shells).
5. State how an isotope of an atom differ from another isotope of the same atom.
6. Draw the atomic structure for the three isotopic forms of hydrogen.
7. Determine from given diagrams whether atoms are neutral, postively, or negatively charged.

RESOURCES

I. Readings and Problems

A. Energy and the Atom, Topic: The Periodic Table, pp. 66-67.

B. The Dictionary

C. Science: A Key to the Future, Topics: Atomic Mass, p. 35; Atomic Numbers, p. 37.

D. Modern Physical Science, Topics: What is the atomic number of an element, p. 23; How many neutrons are in the nucleus of an atom, p. 25.

E. Cambridge Work - A - Text, Topics: Atomic Number, p. 153; Electronic structure, p. 155.

II. Handouts

A. Determining atomic number, atomic weights, number of protons, neutrons, and electrons.

B. Atomic structures to diagram.

C. Diagrams to classify as neutral, positive, or negatively charged.

III. Audio-Visual

A. Teaching Tape: The Atomic Structure (complete worksheet)

B. Filmstrips: Atomic and Molecular Weights
What is in the Atom

C. The Periodic Chart

IV. Activities

A. Prepare a reference chart on basic information on five given elements.

B. Complete a given chart listing the atomic number, atomic weight, number of protons, neutrons, and electrons for given elements.

Self-Evaluation II

1-1. Write a brief definition for the following terms:

a. element

b. atomic number

c. periodic chart

d. isotope

2-2. Use the periodic chart and find the atomic number and atomic weight for the following elements.

NAME	ATOMIC NUMBER	ATOMIC WEIGHT
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____

3-3. Using the same elements listed above, determine the following:

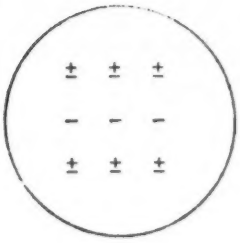
NAME	NUMBER OF ELECTRONS	PROTONS	NEUTRONS
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____
d.	_____	_____	_____

4-4. Draw orbital diagrams and distribute the electrons on the main energy levels for the elements listed in question number two.

5-5. Which of the three fundamental parts of an atom is responsible for the formation of isotopes?

_____

6-6. Under the following conditions, would these atoms be neutral, positive, or negatively charged?



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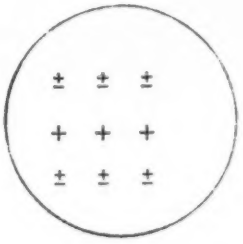

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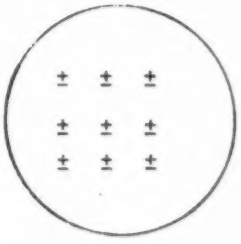


_____

ADVANCED STUDY

1. Make a model showing the three isotopes of hydrogen.

2. Make a poster showing the names, atomic numbers, and weights for several elements of your choice.

3. Make charts showing the atomic structures for several elements of your choice.

4. Make a chart which shows the main energy levels and the maximum number of electrons each shell will hold.

5. Perform a demonstration showing how you can charge neutral materials. (rubber rod, glass rod, comb)

6. Prepare a report on "Atomic Numbers and the Formation of the Periodic Chart."

SECTION III

Behavioral Objectives

Using the prescribed resources, you will, on the Progress and/or LAP Test, be able to:

1. State a definition for the following terms:

   a. family (periodic chart)
   b. period (periodic chart)
   c. metal
   d. nonmetal
   e. inert element
   f. metalloid

2. Locate families and periods of elements on the periodic chart.

3. State two basis for grouping elements into families and periods.

4. List the names of at least five metals, five nonmetals, and five inert gases.

5. List four characteristics for metals and four of nonmetals.

6. Identify where the metals and nonmetals are located on the periodic chart.

RESOURCES

I. Readings and Problems

   A. The Physical World, Topic: The Periodic Table, pp. 159-163.

   B. The Dictionary.

   C. Energy and the Atom, Topic: Periodic Classification, pp. 67-76, 82-84.

   D. Modern Physical Science, Topic: Metals and Nonmetals, pp. 58-59.

   E. Cambridge Work-A-Text, Physical Science, Topic: Elements, pp. 137-139.

II. Handouts

   A. Elements to Classify as Metals, Nonmetals, or Inert Gases
   B. Elements to Classify as Family or Period

III. Audio-Visual

   A. Tape - Lecture: Metals and Nonmetals

IV. Visual

   A. The Periodic Chart

Self-Evaluation III

1-1. State the difference between the following terms:

a. family (periodic chart)

b. period (periodic chart)

2-2. Using the periodic chart, write the name of the elements that are located in Period 3.

2-3. Using the periodic chart, write the name of the elements that are located in family or group VII A.

3-4. Name the fundamental part of an atom that aids in grouping elements into groups.

_____

4-5. List the names of at least two of each of the following:

METALS	NONMETALS	INERT GASES
a.	a.	a.
b.	b.	b.

1-6. Define the term "inert element".

1-7. Draw the atomic structure for the element neon.

1-8. Is the outermost energy level (shell) filled with the maximum number of electrons it will hold?

_____

5-9. List four characteristics for each of the following:

METALS

a.

b.

c.

d.

NONMETALS

a.

b.

c.

d.

6-10. State on which side of the periodic chart the following are found.

Metals _____

Nonmetals _____

ADVANCED STUDY

1. Make a report on one or more of the following metallic elements (present report to the class):
   a. sodium
   b. potassium
   c. copper
   d. silver
   e. gold
   f. aluminum
2. Make a report to the class on one or more of the following nonmetallic elements:
   a. oxygen
   b. sulfur
   c. chlorine
   d. nitrogen
   e. iodine
3. Make a report to the class on one or more of the following inert elements:
   a. helium
   b. neon
   c. argon
4. Make a poster showing one period and one group from the periodic chart
5. Make a chart which shows "The Difference Between Metals and Nonmetals".
6. Draw atomic structures for elements from different periods to show how the electronic configuration differs from period to period.(Include periods IA to VIIA.)

Section IV

Behavioral Objectives

Using the prescribed resources, you will on the Progress and/or LAP Test be able to:

1. State a definition for the following terms:

   a. molecule
   b. mixture
   c. compound
   d. bond
   e. valence
   f. valence electron
   g. chemical formula
   h. chemical equation
   i. radical

2. Write the formulas for simple compounds using valence numbers, symbols, and radicals.

3. List the names and formulas for at least five common household chemicals. (lye, milk of magnesia, coal, baking soda, water)

4. Identify the five basic symbols used to write a chemical equation.

5. Write the chemical equation for some simple chemical reactions.

6. State the difference between a mixture and a compound.

RESOURCES

I. Reading and Problems

   A. The Physical World, Topic: Combining Atoms, pp. 133-144 and 147-173.

   B. The Dictionary.

   C. Energy and the Atom, Topics: The Making of Molecules, pp. 81-83; Chemical Bonding, pp. 85-90; Kinds of Bonds, pp. 90-94.

   D. Science: A Search for Evidence, Topic: What Air Is, pp. 42-43.

   E. Science: A Key to the Future, Topics: Mixtures, p. 29; Compounds, pp. 29-30; Molecules, p. 30; The Formation of Compounds, p. 36; Chemical Formulas, p. 40; Radicals, p. 41; Combining Elements Into Compounds, pp. 41-44.

F. Modern Physical Science, Topics: Valence Numbers, pp. 25-28; Many Compounds Are Formed by Electron Transfer, pp. 28-19; What Are Radicals, pp. 29-31.

II. Handouts

A. Elements to Determine the Number of Valence Electrons
B. Radicals to Learn Names and Symbols
C. Writing Formulas for Compounds
D. Writing Chemical Equations

III. Audio-Visual

A. Teaching Tape: Molecules and Compounds (complete the worksheet)

B. Filmstrips:

1. Molecules and You

2. Element, Compound, and Mixtures

3. Molecules and Ions

C. Transparency

1. Valence Chart

IV. Experiment

A. The Difference Between Compounds and Mixtures

Self-Evaluation IV

1-1. Define the following terms:

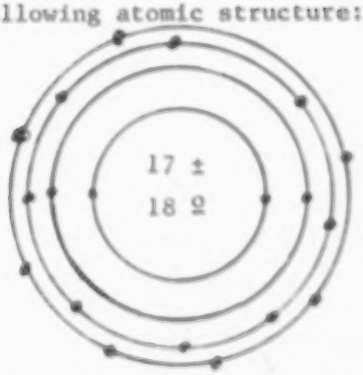
a. mixture

b. compound

c. chemcial formula

d. chemical equation

1-2. From the following atomic structure:



Determine the number of valence electrons. _____

Are the valence electrons for this structure located on the K or L, M, or N energy level? _____

2-2. Using your valence table, write the formula for the following compounds:

a. aluminum oxide _____

b. calcium chloride _____

c. magnesium hydroxide _____

d. sodium chloride _____

3-3. List the name and formula for at least four common household chemicals.

NAME	FORMULA
a.	a.
b.	b.
c.	c.
d.	d.

4-4. Identify the following symbols.

ANSWER

a. $\overset{\leftarrow}{\rightarrow}$ _____

b. $\rightleftharpoons$ _____

c. $\uparrow$ _____

d. $\downarrow$ _____

e. Δ _____

5-5. Write the equation for these reactions.

a. Iron + Sulfur → Iron sulfide

b. Zinc + Hydrogen Sulfate → Zinc Sulfate + Hydrogen

c. Potassium Chlorate $\xrightarrow[\text{dioxide}]{\text{manganese}}$ Potassium Chloride + Oxygen

d. Sodium Hydroxide + Hydrogen Sulfate → Sodium Chloride + Water

ADVANCED STUDY

1. Prepare a poster which shows the valence numbers for some common compounds and radicals.

2. Make a chart which shows the names and formulas for some common household chemicals.

3. Make a report on a household chemical which intereste you most.

4. Mace cut-outs of the symbols used to write equations using different colors of construction paper.

5. List the names and an example for each of the four different kinds of chemical reactions.

6. Make a game related to any aspect in this section which interests you most (idea, puzzle for different equations).

7. Prepare a bulletin board entitled Molecules and Compounds or Compounds and Mixtures.

EXPERIMENT

"Difference Between Compounds and Mixtures"

Materials: powdered sulfur, iron filings, balance, teaspoon, test tube, bar magnet, and test tube holder, bunsen burner.

PROCEDURE:

1. Use a teaspoon to obtain some iron filings and sulfur and record their colors.

   Sulfur _____ Iron filings _____

2. Thoroughly mix these together on a clean sheet of paper and bring the bar magnet close to the mixture. Record your observation.

   _____

   _____

   _____

3. Carefully weigh out 4 grams of sulfur and 7 grams of iron filings and mix them thoroughly together in a test tube.

4. Holding the tube in the test tube holder, heat the mixture until it glows with a red color. Place the hot test tube in a beaker of cold water. After the test tube breaks, observe your findings.

5. Record the color of the resulting substance and the effects of bringing the magnet close to the material.

   _____

   _____

   _____

CONCLUSIONS:

1. Explain why this experiment proved that mixing iron and sulfur without the heat resulted in the formation of a mixture.

2. Explain why this experiment showed that a compound was formed after the heat was applied to a mixture of iron and sulfur.

3. Why were the materials carefully weighed in forming the compound but not the mixture?